```
                        0355 *h IEEE 488 network handler
                        0356
                        0357 ; IEEE 488 Board definitions
                        0358
                        0359 ; Port addresses relative to iBASE
                        0360
0000 =                  0361 iBASE   equ     0
                        0362
                        0363 ; PIO1
                        0364
0002 =                  0365 P1ACTR  equ     iBASE+2
0000 =                  0366 P1ADAT  equ     iBASE+0
00CF =                  0367 mode3   equ     11001111B
                        0368
                        0369 ; Interrupt monitor port and interrupt bits
                        0370
0018 =                  0371 iIREG   equ     iBASE+18H
                        0372
0000 =                  0373 iLT     equ     0               ; Listener/talker
0001 =                  0374 iDMARQ  equ     1               ; Buffer full
0002 =                  0375 iTCI    equ     2               ; Task completed
0003 =                  0376 iSPI    equ     3               ; Special
0004 =                  0377 iOBF    equ     4               ; Output buffer full
0005 =                  0378 iIBNF   equ     5               ; Input buffer full
0040 =                  0379 iSRQ    equ     01000000b       ; Serice request bit
                        0380
                        0381 ; 8291 registers
                        0382
0010 =                  0383 iDOUT   equ     iBASE+10H       ; Data out
0010 =                  0384 iDIN    equ     iBASE+10H       ; Data in
0011 =                  0385 iINTM1  equ     iBASE+11H       ; Interrupt mask 1
0011 =                  0386 iINTS1  equ     iBASE+11H       ; Interrupt status 1
0012 =                  0387 iINTM2  equ     iBASE+12H       ; Interrupt mask 2
0012 =                  0388 iINTS2  equ     iBASE+12H       ; Interrupt status 2
0013 =                  0389 iSPSTS  equ     iBASE+13H       ; Serial poll status
0013 =                  0390 iSPMD   equ     iBASE+13H       ; Serial poll mode
0014 =                  0391 iADDMD  equ     iBASE+14H       ; Address mode
0015 =                  0392 iAUX    equ     iBASE+15H       ; Auxiliary mode register
0016 =                  0393 iADD01  equ     iBASE+16H       ; Address 0/1
0017 =                  0394 iEOSR   equ     iBASE+17H       ; EOS register
                        0395
                        0396 ; 8291 address bits
                        0397
0040 =                  0398 iDT     equ     01000000B       ; Disable talker
0020 =                  0399 iDL     equ     00100000B       ; Disable listener
0080 =                  0400 iARS    equ     10000000B       ; Address register select!
0080 =                  0401 iTO     equ     10000000B       ; Talk only
004C =                  0402 iLO     equ     01000000B       ; Listen only
0001 =                  0403 iADMD1  equ     00000001B       ; Address mode 1
                        0404
                        0405 ; 8291 other bits
                        0406
0000 =                  0407 iBI     equ     0               ; Byte received
0001 =                  0408 iBIBIT  equ     00000001B       ; Same again but different!
0001 =                  0409 iBO     equ     1               ; Byte sent
```

```
0002 =          0410 iERR    equ     2              ; Error, no listeners
0004 =          0411 iEND    equ     4              ; ECS or EOI received
                0412
                0413 ; 8291 auxiliary commands
                0414
0002 =          0415 iARST   equ     2              ; Reset
0024 =          0416 i4MHz   equ     00100100B      ; 4MHz clock
0028 =          0417 i8MHz   equ     00101000B      ; 8MHz clock
0006 =          0418 iSEOI   equ     6              ; Send EOI
0003 =          0419 iFHSHK  equ     3              ; Finish handshake
0009 =          0420 iPPON   equ     00001001B      ; Parallel poll on
0001 =          0421 iPPOFF  equ     00000001B      ; Parallel poll off
                0422
                0423 ; 8291 auxiliary register bits
                0424
0080 =          0425 iAUXA   equ     10000000B      ; MSB for aux reg A
0002 =          0426 iHLDOE  equ     00000010B      ; Holdoff on EOS or EOI
                0427
                0428 ; 8292 registers
                0429
001B =          0430 iCCMD   equ     iBASE+1BH      ; Command register
001A =          0431 iCDAT   equ     iBASE+1AH      ; Data register
                0432
                0433 ; 8292 operation commands
                0434
00F2 =          0435 iRST    equ     0F2H           ; Reset
                0436 ;----------
                0437
                0438 ; General parameters and local data
                0439
000A =          0440 Max.Retries     equ     10
0000 =          0441 Timeout.retries equ     0
                0442
                0443                 cseg
                0444
0000            0445 Retry.count:    defs    1
0001            0446 msg.adr:        defs    2
                0447                 cseg
                0448 ;----------
                0449
                0450 ; Utility Subroutines
                0451
0140            0452 Init.8292:
                0453
                0454 ; Reset 8292: takes 535 uS
                0455
0140 3EF2       0456         ld      a,iRST
0142 D31B       0457         out     (iCCMD),a
0144 0600       0458         ld      b,0
0146 10FE       0459         djnz    $
0148 C9         0460         ret
                0461 ;----------
                0462
0149            0463 Init.8291:
                0464
```

```
                        0465 ; Reset 8291
                        0466
 0149 3E02              0467            ld      a,iARST
 014B D315              0468            out     (iAUX),a
                        0469
                        0470 ; Select 4/8 MHz clock
                        0471
 014D 3E28              0472            ld      a,i8MHz
 014F D315              0473            out     (iAUX),a
                        0474
                        0475 ; Set address mode 1
                        0476
 0151 3E01              0477            ld      a,iADMD1
 0153 D314              0478            out     (iADDMD),a
                        0479
                        0480 ; Set major talk and listen address
                        0481
 0155 3A1700            0482            ld      a,(Slave.ID)
 0158 D316              0483            out     (iADD01),a
                        0484
                        0485 ; Disable minor talker and listener
                        0486
 015A 3EE0              0487            ld      a,iDT + iDL + iARS
 015C D316              0488            out     (iADD01),a
                        0489
                        0490 ; Clear interrupt masks
                        0491
 015E AF                0492            xor     a
 015F D313              0493            out     (iSPMD),a
 0161 D312              0494            out     (iINTM2),a
 0163 D311              0495            out     (iINTM1),a
 0165 D315              0496            out     (iAUX),a        ;por
                        0497
                        0498 ; Setup for parallel poll
                        0499
 0167 3A1700            0500            ld      a,(slave.ID)
 016A 3D                0501            dec     a
 016B E607              0502            and     00000111b
 016D F668              0503            or      01101000b
 016F D315              0504            out     (iAUX),a
                        0505
 0171 C9                0506            ret
                        0507 ;----------
                        0508
 0172                   0509 SENDMSG:
                        0510
                        0511 ; Send a message over the network
                        0512 ; Reg BC -> buffer
                        0513
 0172 ED430100          0514            ld      (msg.adr),bc
                        0515
 0176                   0516 Re.Send.MSG:
                        0517
 0176 3ECA              0518            ld      a,Max.Retries
 0178 32C000            0519            ld      (Retry.Count),a
```

```
                    0520
 017B               0521 Send:
                    0522 ;/
                    0523            cond    trace
                    0524            ld      a,'s'
                    0525            emt     1
                    0526            endc
                    0527 ;/
                    0528
                    0529 ;Request service
                    0530
 017B 3E09          0531            ld      a,iPPON
 017D D315          0532            out     (iAUX),a
 017F 3E41          0533            ld      a,01000001b     ;SRQ and bit 0
 0181 D313          0534            out     (iSPMD),a
                    0535 ;/Wait
 0183 0628          0536            ld      b,40
 0185 10FE          0537            djnz    $
 0187 3E01          0538            ld      a,000000018
 0189 D313          0539            out     (iSPMD),a
                    0540
                    0541 ; Initialize checksum
                    0542
 018B 1600          0543            ld      d,0
                    0544
                    0545 ; RML format code
                    0546
 018D 211500        0547            ld      hl,RMLFMT
 0190 1E01          0548            ld      e,1
 0192 CDE501        0549            call    send.loop
 0195 383C          0550            jr      c,Send.Timeout
                    0551
                    0552 ; Header
                    0553
 0197 2A0100        0554            ld      hl,(msg.adr)
 019A 1E05          0555            ld      e,header.size
 019C CDE501        0556            call    send.loop
 019F 3832          0557            jr      c,Send.Timeout
                    0558
                    0559 ;/
                    0560            cond    trace
                    0561            dec     hl
                    0562            dec     hl
                    0563            ld      a,(hl)
                    0564            push    hl
                    0565            ld      hl,trmsg
                    0566            emt     byteo
                    0567            ld      (hl),-1
                    0568            ld      hl,trmsg
                    0569            emt     msg
                    0570            pop     hl
                    0571            inc     hl
                    0572            inc     hl
                    0573
                    0574            dseg
```

```
                        0575
                        0576 trmsg:  defs    2
                        0577         defs    1
                        0578
                        0579         cseg
                        0580         endc
                        0581 ;/
                        0582
                        0583 ; Get byte count
                        0584
01A1 2B                 0585         dec     hl
01A2 5E                 0586         ld      e,(hl)
01A3 1C                 0587         inc     e
01A4 23                 0588         inc     hl
01A5 CDE501             0589         call    send.loop
01A8 3829               0590         jr      c,Send.Timeout
                        0591
                        0592 ; Clear SPMD and PPOLL
                        0593
01AA AF                 0594         xor     a
01AB D313               0595         out     (iSPMD),a
01AD 3E01               0596         ld      a,iPPOFF
01AF D315               0597         out     (iAUX),a
                        0598
                        0599 ; Send checksum
                        0600
01B1 3E06               0601         ld      a,iSEOI
01B3 D315               0602         out     (iAUX),a
01B5 AF                 0603         xor     a
01B6 92                 0604         sub     d
01B7 CD0902             0605         call    iBYTEO
01BA 3817               0606         jr      c,Send.Timeout  ;and retry
                        0607
                        0608 ; Get acknowledge
                        0609
01BC 01C000             0610         ld      bc,Timeout.retries
01BF DB11               0611 snd6:   in      a,(iINTS1)
                        0612
01C1 CB47               0613         bit     iBI,a
01C3 2007               0614         jr      nz,ACK.ready
                        0615
01C5 10F8               0616         djnz    snd6
01C7 0D                 0617         dec     c
01C8 20F5               0618         jr      nz,snd6
                        0619
                        0620 ; Fall through if timeout
                        0621
01CA 1807               0622         jr      Send.Timeout    ;anc retry
                        0623 ;---------
                        0624
01CC                    0625 ACK.ready:
01CC DB10               0626         in      a,(iDIN)
01CE FEC6               0627         cp      ACK
01D0 C8                 0628         ret     z
                        0629
```

```
01D1                    0630 Send.retry:
                        0631
                        0632 ;/
                        0633            cond    little.e
                        0634            ld      a,'e'
                        0635            emt     1
                        0636            endc
                        0637 ;/
01D1 18A8               0638            jr      send
                        0639 ;----------
                        0640
01D3                    0641 Send.Timeout:
                        0642
                        0643 ;/
                        0644            cond    trace
                        0645            ld      a,'t'
                        0646            emt     1
                        0647            endc
                        0648 ;/
01D3 CD4901             0649            call    Init.8291
01D6 3E02               0650            ld      a,senderr
01D8 210000             0651            ld      hl,Retry.count
01DB 35                 0652            dec     (hl)
01DC C27B01             0653            jp      nz,Send
01DF CD0102             0654            call    Error.Return
01E2 C37601             0655            jp      Re.Send.MSG
                        0656 ;----------
                        0657
01E5                    0658 send.locp:
01E5 7E                 0659            ld      a,(hl)
01E6 82                 0660            add     d
01E7 57                 0661            ld      d,a
01E8 010000             0662            ld      bc,Timeout.retries
                        0663
01EB DB11               0664 snd1:      in      a,(iINTS1)
01ED CB4F               0665            bit     iBO,a
01EF 2007               0666            jr      nz,snd.byte.ready
                        0667
01F1 10F8               0668            djnz    snd1
01F3 0D                 0669            dec     c
01F4 20F5               0670            jr      nz,snd1
                        0671
                        0672 ; Fall through if timeout
                        0673
01F6 37                 0674            scf
01F7 C9                 0675            ret
                        0676 ;----------
                        0677
01F8                    0678 snd.byte.ready:
01F8 7E                 0679            ld      a,(hl)
01F9 D310               0680            out     (iDOUT),a
01FB 23                 0681            inc     hl
01FC 1D                 0682            dec     e
01FD 20E6               0683            jr      nz,send.loop
01FF B7                 0684            or      a
```

```
0200 C9          0685          ret
                 0686 ;----------
                 0687
0201             0688 Error.Return:
0201 211600      0689          ld      hl,Network.status
0204 B6          0690          or      (hl)
0205 77          0691          ld      (hl),a
0206 C31101      0692          jp      NTWRKerror
                 0693 ;----------
                 0694
                 0695 ; Single byte output
                 0696 ; Send byte via 8291
                 0697
0209 F5          0698 iBYTEO: push    af
020A 010000      0699          ld      bc,Timeout.retries
                 0700
                 0701 ; Wait for ready
                 0702
020D DB11        0703 iBO1:   in      a,(iINTS1)
020F CB4F        0704          bit     iBO,a
0211 2008        0705          jr      nz,send.byte
                 0706
0213 10F8        0707          djnz    iBO1
0215 0D          0708          dec     c
0216 20F5        0709          jr      nz,iBO1
                 0710
                 0711 ; Fall through
                 0712
0218             0713 bus.error:
                 0714
0218 F1          0715          pop     af
0219 37          0716          scf
021A C9          0717          ret
                 0718 ;----------
                 0719
021B             0720 send.byte:
                 0721
021B F1          0722          pop     af
021C D310        0723          out     (iDOUT),a
021E B7          0724          or      a       ;clear carry
021F C9          0725          ret
                 0726 ;----------
                 0727 ;----------
                 0728
0220             0729 RECEIVEMSG:
                 0730
                 0731 ; Receive a message over the network
                 0732
                 0733 ; BC -> buffer
                 0734
0220 ED430100    0735          ld      (msg.adr),bc
                 0736
0224             0737 Re.Receive.MSG:
                 0738
                 0739 ; Return to here from a transmission
```

```
                        0740 ; error or timeout
                        0741
0224 3E0A               0742            ld      a,Max.retries
0226 320000             0743            ld      (Retry.count),a
                        0744
0229                    0745 Re.call:
                        0746 ;/
                        0747            cond    trace
                        0748            ld      a,'r'
                        0749            emt     1
                        0750            endc
                        0751 ;/
                        0752
0229 010000             0753            ld      bc,Timeout.retries
022C                    0754 Rcv.lp0:
022C DB11               0755            in      a,(iINTS1)
022E CB47               0756            bit     iBI,a
0230 2007               0757            jr      nz,First.byte.ready
                        0758
0232 10F8               0759            djnz    Rcv.lp0
0234 0D                 0760            dec     c
0235 20F5               0761            jr      nz,Rcv.lp0
                        0762
                        0763 ; Fall through if timeout
                        0764
0237 1845               0765            jr      Receive.retry
                        0766 ;----------
                        0767
0239                    0768 First.byte.ready:
                        0769
0239 DB10               0770            in      a,(iDIN)
023B 57                 0771            ld      d,a
023C 321500             0772            ld      (RMLFMT),a
                        0773
023F 2A0100             0774            ld      hl,(msg.adr)
                        0775
0242                    0776 Rcv.loop:
                        0777
0242 010000             0778            ld      bc,Timeout.retries
0245                    0779 Rcv.lp1:
0245 DB11               0780            in      a,(iINTS1)
0247 CB67               0781            bit     iEND,a
0249 2013               0782            jr      nz,Rcv.last.byte
                        0783
024B CB47               0784            bit     iBI,a
024D 2007               0785            jr      nz,Rcv.byte.ready
                        0786
024F 10F4               0787            djnz    Rcv.lp1
0251 0D                 0788            dec     c
0252 20F1               0789            jr      nz,Rcv.lp1
                        0790
                        0791 ; Fall through if timeout
                        0792
0254 1828               0793            jr      Receive.retry
                        0794 ;----------
```

```
                    0795
0256                0796 Rcv.byte.ready:
                    0797
0256 DB10           0798        in      a,(iDIN)
0258 77             0799        ld      (hl),a
0259 23             0800        inc     hl
025A 82             0801        add     d
025B 57             0802        ld      d,a
025C 18E4           0803        jr      Rcv.loop
                    0804
                    0805 ;----------
                    0806
025E                0807 Rcv.last.byte:
                    0808
025E CB47           0809        bit     iBI,a
0260 2009           0810        jr      nz,Last.byte.ready
0262 DB11           0811        in      a,(iINTS1)
0264 10F8           0812        djnz    Rcv.last.byte
0266 0D             0813        dec     c
0267 20F5           0814        jr      nz,Rcv.last.byte
                    0815
                    0816 ; Fall through if timeout
                    0817
0269 1813           0818        jr      Receive.retry
                    0819 ;----------
                    0820
026B                0821 Last.byte.ready:
                    0822
026B DB10           0823        in      a,(iDIN)
026D 82             0824        add     d
026E 2009           0825        jr      nz,Bad.checksum
                    0826
0270 3E06           0827        ld      a,ACK
0272 CDC902         0828        call    iBYTEO
0275 3807           0829        jr      c,Receive.retry
                    0830
                    0831 ;/
                    0832        cond    trace
                    0833        ld      a,CR
                    0834        emt     1
                    0835        endc
                    0836 ;/
                    0837
0277 AF             0838        xor     a
0278 C9             0839        ret
                    0840 ;----------
                    0841
0279                0842 Bad.checksum:
                    0843
0279 3E15           0844        ld      a,NAK
027B CDC902         0845        call    iBYTEO
                    0846 ;/
                    0847        cond    little.e
                    0848        ld      a,'e'
                    0849        jr      xxx
```

```
                        0850            endc
                        0851 ;/
  027E                  0852 Receive.retry:
                        0853
                        0854 ; Come here on a receive timeout
                        0855
                        0856 ;/
                        0857            cond    trace
                        0858            ld      a,'t'
                        0859            endc
                        0860            cond    little.e
                        0861 xxx:       emt     1
                        0862            emt     20h
                        0863            endc
                        0864 ;/
  027E CD4901           0865            call    Init.8291
  0281 21C000           0866            ld      hl,Retry.Count
  0284 35               0867            dec     (hl)
  0285 C22902           0868            jp      nz,Re.call
                        0869
  0288                  0870 Receive.Timeout:
                        0871
  0288 3EC2             0872            ld      a,rcverr
  028A CDC102           0873            call    Error.Return
                        0874
  028D C32402           0875            jp      Re.Receive.MSG
                        0876 ;----------
                        0877
  0000                  0878            end
```

Symbols:

```
0006  ACK          01CC' ACK.READY   0010  ACTIVE     0279' BAD.CHECKSUM              E010  BREAK      0218' BUS.ERROR  010D' CNFGTBLADR
0016' CONFIGTBL    C00D  CR          0201' ERROR.RETURN                0000  FALSE      0239' FIRST.BYTE.READY         0005  HEADER.SIZE
0024  I4MHZ        0028  I8MHZ       0016  IADD01     0014  IADDMD     0001  IADMD1     0080  IARS       0002  IARST      0015  IAUX
0080  IAUXA        C000  IBASE       0000  IBI        0001  IBIBIT     0001  IBO        020D' IBO1       0209' IBYTEO     0018  ICCMD
001A  ICDAT        00ED' ID.MSG      0010  IDIN       0020  IDL        0001  IDMARQ     0010  IDOUT      0040  IDT        0004  IEND
0017  IEOSR        0002  IERR        0003  IFHSHK     0002  IHLDOE     0005  IIBNF      0011  IINTM1     0012  IINTM2     0011  IINTS1
0012  IINTS2       0018  IIREG       0040  ILO        0000  ILT        00C8' IN.ID      0149' INIT.8291  0140' INIT.8292  0004  IOBF
0001  IPPOFF       0009  IPPON       00F2  IRST       0006  ISEOI      0003  ISPI       0013  ISPMD      0013  ISPSTS     0040  ISRQ
0002  ITCI         0080  ITO         0002  KBDC       026B' LAST.BYTE.READY           000A  LF         03F' LIST.ID     0000  LITTLE.E
FFFF  LOCAL.DISKS                    0000  LOCAL.PRINTER              0040  LOGIN      0135' LOGIN.ID   0133' LOGIN.MSG  0120' LOGINPR
000A  MAX.RETRIES                    00CF  MODE3      00C7  MSG        0001" MSG.ADR    0015  NAK        0016' NETWORK.STATUS
0000G NIOS         0111' NTWRKERROR                    00C3' NTWRKINIT 0102' NTWRKSTS   0112' NTWRKWBOOT               0001  OUTC
0002  P1ACTR       0000  P1ADAT      0256' RCV.BYTE.READY                025E' RCV.LAST.BYTE            0242' RCV.LOOP   022C' RCV.LPC
0245' RCV.LP1      0002  RCVERR      0229' RE.CALL    0224' RE.RECEIVE.MSG       0176' RE.SEND.MSG              027E' RECEIVE.RETRY
0288' RECEIVE.TIMEOUT                0220' RECEIVEMSG                    0000" RETRY.COUNT              0015' RMLFMT     0000  ROM
0000  RCMC5        000E  SCROLL      0178' SEND       021B' SEND.BYTE 01E5' SEND.LOOP  01D1' SEND.RETRY               01D3' SEND.TIMEOUT
0002  SENDERR      0172' SENDMSG     0017' SLAVE.ID   01F8' SND.BYTE.READY       01EB' SND1       01BF' SND6       0000  TIMEOUT.RETRIE
0000  TRACE        FFFF  TRUE
```

No errors